



## ELECTROCHEMICAL BATTERY, ELECTRODE THEREFOR AND METHOD FOR MANUFACTURING THE SAME

### BACKGROUND OF THE INVENTION

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#### 1. Field of the Invention

The present invention relates to an electrochemical battery and, more particularly, to an electrode of an electrochemical battery.

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#### 2. Description of the Conventional Art

In general, a battery is to convert chemical energy to electric energy by using a contact potential difference between suitable materials.

There are various kinds of batteries which can be technically classified into a first primary battery, a secondary battery, a fuel cell and solar battery.

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The first primary battery, such as, a manganese battery, an alkali battery, a mercury battery, a silver oxide battery, performs only a discharging reaction to convert chemical energy into electric energy. The secondary battery can be used by being repeatedly charged and discharged differing from the first primary battery having only one time discharging reaction. The fuel cell converts 20 combustion heat of fuel such as hydrogen or hydrocarbon as it is into electric energy. The solar battery converts light energy to electric energy.

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Figure 1 is a schematic view showing an example of a general fuel cell.

As shown in Figure 1, the fuel cell includes a fuel electrode (anode) 14 and an oxygen electrode (cathode) 16 with electrolyte interposed therebetween.

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In the fuel cell with such a structure, a fuel such as hydrogen is supplied to

the fuel electrode 14 through a fuel supply pipe 13 and at the same time oxidant such as oxygen or air is supplied to the oxygen electrode 16 through an oxidant supply pipe 17.

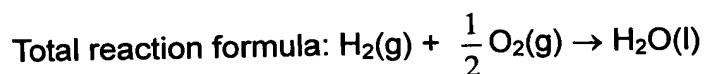
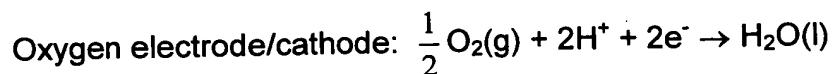
At this time, electrons are discharged with ~~an~~ the aid of a catalyst and 5 oxidation takes place in the anode ~~pole~~ 14. The electrons generated from the anode 14 are transferred to the cathode 16 by way of a load 18 connected to the anode 14 and the cathode 18 16.

In the cathode 16, as a reduction reaction takes place with the electrons transferred by the aid of the catalyst, the oxidant is reduced.

10 Positive ions/negative ions are transferred from the anode 14 to the cathode 16 or from the cathode 16 to the anode 14 through the electrolyte 12 interposed between the anode 14 and the cathode 16.

In particular, if hydrogen is used as the fuel, as the fuel cell operates, 15 ionization of hydrogen proceeds to hydrogen ~~ion~~ ions  $H^+$  and ~~electron~~ electrons  $e^-$  in the anode 14, and  $H^+$  generated in the anode 14 is moved to the cathode 16 through the electrolyte and the ~~electron~~ electrons  $e^-$  ~~is~~ are transferred to an external load 18 through the anode 14.

20 In the cathode 16,  $H^+$  transferred through the electrolyte 12 reacts with oxygen in the air, generating water together with heat of reaction, which is expressed as the following reaction formula:



In the fuel cell, generally, a load is connected to the anode 14 and the cathode 16. When the fuel cell operates, ~~electron~~ electrons ~~e~~ is are continuously generated from the anode 14 and flows to the cathode 16 through the load, that is, as electrons are transferred from the anode 14 to the cathode 16, 5 a current is generated to operate an electric device, etc or the like.

Meanwhile, the type of electrode used as the cathode or the anode of the electrochemical battery such as the fuel cell greatly affects the performance of the battery such as a lifespan of the battery or its output according to its material and characteristics.

10 Figure 2 shows a structure of the electrode of the conventional fuel cell.

As shown in Figure 2, the electrode 20 of the conventional fuel cell includes a ~~form~~ foam body 23 made of Ni in which mixture of electrode catalyst particles 21 made of metal halide (MH), and polytetrafluoro ethylene 22, as fluoride polymer, is infiltrated, and a ~~mash~~ mesh 24 made of Ni enclosing the 15 foam body 23.

In detail, the granule type electrode catalyst 21 and PTFE(Poly Tetrafluoro Ethylene) 22 are mixed to a mixture 25 which is infiltrated in the foam body 23 to fill the void part parts of the foam body 23.

The foam body 23 filled with the mixture 25 of electrode catalyst 21 and 20 PTFE 22 is enclosed by the ~~mash~~ mesh 24 which maintains the shape of the foam body 23, protects the foam body 23 and has fine holes for preventing the electrode catalyst 21 and PTFE 22 from being separate separated, and then is pressed by using a roller to thereby processing process the electrode 20.

However, the electrode 20 constructed and fabricated as described above 25 has a problem that since the ~~mash~~ mesh 24 is additionally used to prevent the

electrode catalyst 21 or PTFE 22 from being separate separated from the foam body 23, a specific surface area of the electrode catalyst 21 is reduced, resulting in that to cause the volume and weight of the electrode are to be relatively increased in its fabrication to meet a required performance.

5 In addition, an incomplete combination between the electrode catalyst 21 and PTFE 22 weakens durability, and in case of being used as the electrode 20, the electrode catalyst 21 is separated from the electrode 20, thus degrading a the performance as the electrode.

## 10 SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to provide an electrochemical battery, an electrode therefore and a method for manufacturing the electrode that are capable of simplifying providing a simple manufacturing method, reducing volume, heightening increasing flexibility, durability and 15 specific surface area of an electrode catalyst, and heightening an efficiency of a battery.

~~To achieve these objects, there is provided an electrode of an electrochemical battery including: an electrode catalyst and an electrode catalyst support member made of a fiber stack of conductive metal material to which the electrode catalyst is attached.~~

To achieve the above object, there is provided an electrode of an electrochemical battery including: an electrode catalyst; and a catalyst holding body for holding and confining the electrode catalyst by being entangled with the electrode catalyst.

25 ~~To achieve the above objects, there is also provided an electrode of an~~

~~electrochemical battery including: an electrode catalyst layer made of an electrode catalyst; and a pair of electrode catalyst support layers installed with the electrode catalyst layer interposed therebetween and being made of a fiber stack of conductive metal material.~~

5       To achieve the above object, there is also provided a method for fabricating an electrode of electrochemical battery, including: a first step of fabricating a catalyst holding body having fine spaces; and a second step of holding and confining an electrode catalyst in the catalyst holding body, the catalyst holding body and the power type electrode catalyst being entangled with each other.

10      To achieve the above objects, there is also provided an electrode of an electrochemical battery including: an electrode catalyst layer made of an electrode catalyst; and a pair of electrode catalyst support layers installed with the electrode catalyst layer interposed therebetween and being made of a fiber stack of conductive metal material.

15      To achieve the above objects, there is also provided a battery having such an electrode as described above.

16      To achieve the above objects, there is also provided an electrode of an electrochemical battery made of a fiber stack of an electrode catalyst.

20      To achieve the above objects, there is also provided a method for manufacturing an electrode of an electrochemical battery including the steps of: attaching an electrode catalyst to an electrode catalyst support member made of a fiber stack of conductive metal material; and forming the electrode catalyst attached electrode catalyst support member as an electrode of an electrochemical battery.

~~To achieve the above objects, there is also provided a method for manufacturing an electrode of an electrochemical battery including the steps of: forming an electrode catalyst layer made of an electrode catalyst on a first electrode catalyst support layer made of a fiber stack of conductive metal material; and forming a second electrode catalyst support layer made of a fiber stack of conductive metal material on the electrode catalyst layer formed on the first electrode catalyst support layer, the second electrode catalyst support layer making a pair with the first electrode catalyst support layer.~~

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#### BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the 15 description serve to explain the principles of the invention.

In the drawings:

Figure 1 is a schematic view showing an example of a general fuel cell;

Figure 2 is a view showing a structure of an electrode of a fuel cell in accordance with a conventional art;

20 Figure 3A is a schematic view showing a construction of an electrode of an electrochemical battery in accordance with the first embodiment of the present invention;

Figure 3B is a view showing an enlarged portion of Figure 3A;

25 Figure 4 is a schematic view showing a modification of the electrode of an electrochemical battery of Figure 3A;

Figure 5 is a sectional view showing the electrode having a housing enclosing the electrode of Figure 3A;

Figure 6 is a schematic view showing a construction of an electrode of an electrochemical battery in accordance with the second embodiment of the present invention;

Figure 7 is a flow chart of a process of manufacturing the electrochemical battery of Figure 3A; and

Figure 8 is a flow chart of a process of manufacturing the electrochemical battery of Figure 6.

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#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An electrochemical battery, electrode therefore and a method for manufacturing the same will now be described in detail with reference to the accompanying drawings.

Figure 3A is a schematic view showing a construction of an electrode of an electrochemical battery in accordance with the first embodiment of the present invention; and Figure 3B is a view showing an enlarged portion of Figure 3A.

As shown in Figures 3A and 3B, an electrode 30 of an electrochemical battery in accordance with the first embodiment of the present invention includes an electrode catalyst 31, and ~~an electrode catalyst support member, i.e., a~~ catalyst holding body 32 made of a fiber stack of conductive metal material to which the electrode catalyst 31 is attached.

As the electrode catalyst 31, a hydrogen storage alloy such as metal halide is preferably used.

The electrode catalyst 31 can be transformed to various forms. It has a fiber form such as a filament, and preferably a granule form.

Preferably, the electrode catalyst 31 is coated with nickel on its surface. In this respect, Especially, if the electrode catalyst support member the catalyst holding body 32 (to be described) is made of nickel or nickel alloy, since the electrode catalyst 31 and the electrode catalyst support member 32 are made of the same material, the electrode catalyst 31 can be more firmly adhered to the electrode catalyst support member 32, so that separation of the electrode catalyst 31 from the electrode catalyst support member 32 can be prevented. alloy material, the electrode catalyst 31 and the catalyst holding body 32 are made of the same material so that the electrode catalyst 31 can be more firmly adhered in the catalyst holding body 32 and confined within the catalyst holding body 32, and thus, separation of the electrode catalyst 31 from the catalyst holding body 32 can be prevented.

In particular, the electrode catalyst 31 needs to be subjected to a surface processing for improvement of a performance. Coated If the electrode catalyst 31 is coated with Ni, which is the same material as that of the electrode catalyst support member catalyst holding body 32, the adhesiveness of the electrode catalyst 31 to the electrode catalyst support member catalyst holding body 32 bettors is increased compared to the electrode catalyst processed with fluoride.

The electrode catalyst support member catalyst holding body 32 is made of conductive metal material, and preferably, it is made of nickel or nickel alloy. Especially, the electrode 31 itself can be a fiber stack to constitute the electrode catalyst support member catalyst holding body 32.

A diameter and a length of each of the fiber fibers constituting the

~~electrode catalyst support member catalyst holding body~~ 32 can be determined depending on usage conditions of the electrode. In the preferred embodiment of the present invention, the diameter of the fiber of the ~~electrode catalyst support member catalyst holding body~~ 32 is 1 to 100  $\mu\text{m}$  and its length is 10 to 10,000  $\mu\text{m}$ .

As shown in Figure 3B, the ~~electrode catalyst support member catalyst holding body~~ 32 can be a fiber sintered body resulting from sintering fibers 32a of conductive metal material or a non-woven fabric made of conductive metal material.

Especially, as the ~~electrode catalyst support member catalyst holding body~~ and its manufacturing method, the present invention uses a method for fabricating a stack of fine metallic threads and metal fiber sintered body as disclosed in Korean Patent Publication No. 10-2001-0086569 or Korean Patent Publication No. 10-2001-0018726, but it is not limited thereto.

Accordingly, the catalyst holding body 32 can be formed as a porous tissue and the porous tissue can be implemented as one line.

As shown in Figure 4, the ~~electrode catalyst support member catalyst holding body~~ 32 can be constructed as a pair of sheets 41 with the electrode catalyst 31 infiltrated with a certain depth and attached only at one side. The pair of sheets 41 can be mutually overlapped in such a manner that the sides where the electrode catalyst 31 is attached meet together.

As shown in Figure 5, the electrode 50 of the electrochemical battery in accordance with the present invention may additionally include a housing 55 which accommodates the ~~electrode catalyst support member catalyst holding body~~ 32, is made of conductive metal material and has a plurality of holes.

The housing 55 having a plurality of holes may be a mesh, and the housing 55 is preferably fabricated with nickel or nickel alloy.

The ~~electrode catalyst support member~~ catalyst holding body 32 may additionally include a fluoro polymer (not shown) such as PTFE.

5       Figure 6 is a schematic view showing a construction of an electrode of an electrochemical battery in accordance with the second embodiment of the present invention.

The electrode of an electrochemical battery of the present invention can be constructed with the electrode catalyst and the ~~electrode catalyst support member~~ catalyst holding body each formed as a layer. That is, as shown in 10 Figure 6, an electrode 60 of an electrochemical battery in accordance with the second embodiment of the present invention includes an electrode catalyst layer 61 having electrode catalyst 31 and a pair of first and second ~~electrode catalyst support layers~~ catalyst holding bodies 62 and 63 which are installed formed 15 with the electrode catalyst layer 61 interposed therebetween and made of a fiber stack.

As the electrode catalyst 31, a hydrogen storage alloy such as metal halide (MH) is preferably used. The electrode catalyst layer 61 may contain a fluoro polymer 64 such as PTFE in addition to the electrode catalyst 31. PTFE has an 20 the effect of restraining the generation of hydrogen. That is, the electrode catalyst layer 61 can be constructed with a mixture of the electrode catalyst 31 and PTFE.

The electrode catalyst 31 can be transformed to various forms. It has a fiber form such as a filament, and preferably a granule form.

Preferably, the electrode catalyst 31 is coated with nickel on its surface. In 25 this respect, especially, if the first and second ~~electrode catalyst support layers~~

catalyst holding bodies 62 and 63 are made of nickel or nickel alloy material, since the electrode catalyst 31 and the first and second ~~electrode catalyst support layers~~ catalyst holding bodies 62 and 63 are made of the same material, so that the electrode catalyst 31 can be more firmly adhered to the first and second ~~electrode catalyst support layers~~ catalyst holding bodies 62 and 63, so that thus, separation of the electrode catalyst 31 from the ~~electrode catalyst support member~~ 32 catalyst holding bodies 62 and 63 can be prevented.

In particular, the electrode catalyst 31 needs to be subjected to a surface processing for improvement of a performance. ~~Ceated If the electrode catalyst 31 is coated~~ with Ni, which is the same material as that of the first and second ~~electrode catalyst support layers~~ catalyst holding bodies 62 and 63, the adhesiveness of the electrode catalyst 31 to the ~~electrode catalyst support member~~ catalyst holding body 32 bettters is increased compared to the electrode catalyst processed with fluoride.

The first and second ~~electrode catalyst support layers~~ catalyst holding bodies 62 and 63 are made of conductive metal material, and preferably, they are made of nickel or nickel alloy.

A diameter and a length of each of the fiber fibers constituting the first and second ~~electrode catalyst support layers~~ catalyst holding bodies 62 and 63 can be determined depending on usage conditions of the electrode. In the preferred embodiment of the present invention, the diameters of the fiber of the first and second ~~electrode catalyst support layers~~ catalyst holding bodies 62 and 63 are 1 to 100  $\mu\text{m}$  and the lengths are 10 to 10,000  $\mu\text{m}$ .

As shown in Figure 6, the first and second ~~electrode catalyst support~~

layers catalyst holding bodies 62 and 63 can be a fiber sintered body resulting from sintering fibers 32a of conductive metal material or a non-woven fabric made of a conductive metal material.

Especially, as the ~~electrode catalyst support member catalyst holding body~~ and its manufacturing method, the present invention uses a method for 5 fabricating a fine metallic thread and metal fiber sintered body as disclosed in Korean Patent Publication No. 10-2001-0086569 or Korean Patent Publication No. 10-2001-0018726, but it is not limited thereto.

As shown in Figure 6, the electrode 50 of the electrochemical battery in 10 accordance with the second embodiment of the present invention may additionally include a housing 65 which accommodates the ~~electrode catalyst support member catalyst holding body~~ 32, is made of conductive metal material and has a plurality of holes.

The housing 65 having a plurality of holes may be a mesh, and the housing 15 65 is preferably fabricated with nickel or nickel alloy.

The battery in accordance with the second embodiment of the present invention can be applied in the same way except for the descriptions for the battery in accordance with the first embodiment.

The method for manufacturing an electrode of an electrochemical battery in 20 accordance with the present invention will now be described in detail.

Figure 7 is a flow chart of a process of manufacturing an electrochemical battery of Figure 3A.

First of all, fabrication of the ~~electrode catalyst support member catalyst holding body~~ 32 is of importance. As described above, it needs to be fabricated 25 to form a fiber stack made of conductive metal material, especially, nickel or nickel

alloy material. The fiber stack and its manufacturing method are as disclosed in Korean Patent Publication No. 10-2001-0086569 and Korean Patent Publication No. 10-2001-0018726, ~~of which detailed descriptions are omitted~~.

As shown in Figure 7, the method for manufacturing the electrode of an electrochemical battery in accordance with the first embodiment of the present invention including the steps of: attaching the electrode catalyst 31 to the ~~electrode catalyst support member catalyst holding body~~ 32 made of a fiber stack of conductive metal material; and forming the electrode catalyst-attached ~~electrode catalyst support member catalyst holding body~~ 32 as an electrode 30 of an electrochemical battery.

The electrode catalyst 31 preferably can have a filament form, and more preferably a granule form.

In the attaching step, the ~~electrode catalyst support member catalyst holding body~~ 32 is put in a solution, and them onto on which the electrode catalyst 31 is dispersed, thereby attaching the electrode catalyst 31 to the ~~electrode catalyst support member catalyst holding body~~ 32.

For dispersion of the electrode catalyst 31, reactivity and viscosity with respect to the electrode catalyst 31 are taken into consideration and a solution such as alcohol which does is not reacted react with the electrode catalyst 31 is used. That is, in a state that the ~~electrode catalyst support member catalyst holding body~~ 32 is put in the solution, the electrode catalyst 31 is dispersed so as to be introduced into and attached to the fiber stack constituting the ~~electrode catalyst support member 32. catalyst holding body 32, as well as being attached to a surface layer of the fiber stack.~~

In a different method for the attaching step, liquid particles including the

granule type electrode catalyst 31 are dispersed ~~to onto~~ the ~~electrode catalyst support member catalyst holding body~~ 32 in order to attach the electrode catalyst 31 to the ~~electrode catalyst support member catalyst holding body~~ 32.

The attaching step includes a sub-step of drying the ~~electrode catalyst support member catalyst holding body~~ 32 after the liquid particles are dispersed or after the electrode catalyst 31 is dispersed.

Besides, various methods such as liquid phase infiltration, precipitation, liquid particle spray, dry spray, etc. can be ~~adopted used~~ to attach the electrode catalyst 31 to the ~~electrode catalyst support member catalyst holding body~~ 32.

The forming step includes the steps of: press-molding the ~~electrode catalyst support member catalyst holding body~~ 32 with the electrode catalyst 31 attached to the ~~electrode catalyst support member catalyst holding body~~ 32 by using a roller; and processing the press-molded ~~electrode catalyst support member catalyst holding body~~ 32 to an electrode 30 in a desired size.

The pressed catalyst holding body 32 confines the electrode catalyst therein, and even if a fluid is transmitted through the catalyst holding body 32, the electrode catalyst 31 cannot flow out.

In the press-molding step, the pair of ~~electrode catalyst support members catalyst holding bodies~~ 32 with the electrode catalyst 31 attached to the ~~electrode catalyst support member catalyst holding body~~ 32 can be press-molded in such a manner that the surfaces on which the electrode catalyst is attached are mutually overlapped overlap with each other.

Following the processing step, a step of covering the processed electrode 30 with the housing 55 made of metal material with a conductivity and having the plurality of holes can be additionally provided.

Figure 8 is a flow chart of a process of manufacturing the electrochemical battery of Figure 6.

A method for manufacturing an electrode of an electrochemical battery in accordance with the second embodiment of the present invention includes the 5 steps of: forming an electrode catalyst layer 61 made of an electrode catalyst 31 on a first ~~electrode catalyst support layer catalyst holding body~~ 62 made of a fiber stack of conductive metal material; and forming a second ~~electrode catalyst support layer catalyst holding body~~ 63 made of a fiber stack of conductive metal material on the electrode catalyst layer 61 formed on the first ~~electrode catalyst support layer catalyst holding body~~ 62, the second ~~electrode catalyst support layer catalyst holding body~~ 63 making a pair with the first ~~electrode catalyst support layer catalyst holding body~~ 62.

The electrode catalyst 31 preferably may have a filament form, and more preferably a granule form.

15 In the method for manufacturing a battery in accordance with the second embodiment of the present invention, after the step of forming the ~~support layer catalyst holding bodies~~, a molding and processing step can be additionally provided in which the first and second ~~electrode catalyst support layers catalyst holding bodies~~ 62 and 63 with the electrode catalyst 31 attached to 20 ~~thereto the electrode catalyst support member 32~~ are press-molded by using a roller or the like, and processed to into the electrode 30 in of a desired size.

25 ~~In the method for manufacturing a battery in accordance with the second embodiment of the present invention, after the step of forming the support layer, a step is additionally provided in which the processed electrode 30 is covered with the housing 55 made of metal material with a~~

~~conductivity and having the plurality of holes.~~

The battery in accordance with the second embodiment of the present invention can be applied in the same way except for the descriptions for the battery in accordance with the first embodiment.

5 As so far described, the electrochemical battery, its electrode and the method for manufacturing the electrode of the present invention have the following advantages.

That is, the manufacturing method is simple and the battery can be small in volume and has a high flexibility and durability. In addition, the specific surface  
10 area of the electrode catalyst is high.

The battery of the present invention has an improved efficiency compared to that of the conventional art.

In addition, since the ~~electrode catalyst support member catalyst holding body~~ of the electrode is made of the fiber stack, alkali fuel with a low  
15 surface tension can be easily infiltrated due to a capillary phenomenon, thereby enhancing an efficiency of the battery.

It will be apparent to those skilled in the art that various modifications and variations can be made in electrochemical battery of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the  
20 present invention cover modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. An electrode of an electrochemical battery comprising:

an electrode catalyst; and

5 ~~an electrode catalyst support member made of a fiber stack of conductive metal material to which the electrode catalyst is attached.~~

a catalyst holding body for holding and confining the electrode catalyst by being entangled with the electrode catalyst.

10 2. The electrode of claim 1, wherein the electrode catalyst has a granule form type.

3. The electrode of claim 1, wherein the electrode catalyst has a filament shape form.

15 4. ~~The electrode of one of claims 1 to 3, wherein the surface of the electrode catalyst is coated with nickel.~~

The electrode of claim 1, wherein the electrode catalyst is formed as an aggregation of fine fibers.

20 5. ~~The electrode of claim 4, wherein the electrode catalyst support member is made of nickel or a nickel alloy.~~

The electrode of 1, wherein a surface of the electrode catalyst is coated with nickel.

6. ~~The electrode of claim 1, wherein the electrode catalyst support member is a fiber sintered body formed by sintering fibers of conductive metal material.~~

The electrode of claim 1, wherein the electrode catalyst is  
5 metal halide.

7. ~~The electrode of claim 1, wherein the electrode catalyst support member is formed with a pair of sheets with an electrode catalyst attached only at one side thereof, and the pair of sheets are mutually overlapped in such a manner that the sides with the electrode catalyst attached thereon meet.~~

The electrode of claim 1, wherein the electrode catalyst is  
hydrogen storage alloy.

15 8. ~~The electrode of claim 1, further comprising:~~  
~~a housing for accommodating the electrode catalyst support member, being made of metal material with a conductivity, and having a plurality of holes.~~

The electrode of claim 1, wherein the catalyst holding body is  
20 an aggregation of fibers made of a conductive metal material.

9. ~~The electrode of claim 8, wherein the housing is a mesh.~~

The electrode of claim 8, wherein the fiber has a length of 10  
~ 10,000 $\mu$ m.

10. ~~The electrode of claim 8 or 9, wherein the housing is made of nickel or nickel alloy.~~

The electrode of claim 8, wherein the fiber has a diameter of 1 ~ 100 $\mu$ m.

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11. ~~The electrode of claim 1, wherein the electrode catalyst support member additionally contains fluoro polymer.~~

The electrode of claim 1, wherein the catalyst holding body is nickel or nickel alloy.

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12. ~~The electrode of claim 11, wherein the fluoro polymer is PTFE.~~

The electrode of claim 1, wherein the catalyst holding body contains fluoro polymer.

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13. ~~The electrode of claim 1, wherein the fiber of the electrode catalyst support member has a diameter of 1 ~ 100  $\mu$ m.~~

The electrode of claim 10, wherein the fluoro polymer is PTFE.

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14. ~~The electrode of claim 1 or 13, wherein the fiber constituting the electrode catalyst support member has a length of 10 ~ 10,000  $\mu$ m.~~

An electrode of an electrochemical battery comprising:

an electrode catalyst in a power form; and

a catalyst holding body formed as a thin plate, having a fiber tissue entangled with the electrode catalyst, and holding and confining the electrode catalyst therein.

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15. ~~The electrode of claim 1, wherein the electrode catalyst is metal halide.~~

The electrode of claim 14, wherein the fiber of the fiber tissue  
5 has a length of 10~10,000 $\mu\text{m}$  and a diameter of 1~100 $\mu$ .

16. ~~The electrode of claim 1, wherein the electrode catalyst is hydrogen storage alloy.~~

An electrode of an electrochemical battery comprising:  
10 an electrode catalyst in a power form; and  
a catalyst holding body formed as a thin plate having a porous tissue,  
and holding and confining the electrode catalyst therein.

17. ~~An electrochemical battery having the electrode of claim 1.~~

15 The electrode of claim 16, wherein the porous tissue is  
formed as one line.

18. ~~The battery of claim 17, wherein the electrochemical battery is a fuel cell.~~

20 An electrode of an electrochemical battery comprising:  
a multi-type catalyst holding body formed as two thin plates each  
having a fiber tissue are attached to each other; and  
a power type electrode catalyst confined between the two thin plates.

25 ~~An electrode of an electrochemical battery made of a fiber~~

~~stack of an electrode catalyst.~~

The electrode of claim 18, wherein the multi-type catalyst holding body has a wave form.

- 5        20.     ~~A method for manufacturing an electrode of an electrochemical battery comprising the steps of:~~  
~~attaching an electrode catalyst to an electrode catalyst support member made of a fiber stack of conductive metal material; and~~  
~~forming the electrode catalyst support member with the electrode catalyst attached thereto as an electrode of an electrochemical battery.~~  
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An electrochemical battery having the electrode of claim 1.

21.     ~~The method of claim 20, wherein the electrode catalyst has a granule form.~~

- 15
- A method for fabricating an electrode of electrochemical battery comprising:  
a first step of fabricating a catalyst holding body having fine spaces;  
and  
a second step of holding and confining an electrode catalyst in the catalyst holding body, the catalyst holding body and the power type electrode catalyst being entangled with each other.  
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22.     ~~The method of claim 20, wherein, in the attaching step, the electrode catalyst support member is put in a solution, and the electrode catalyst is dispersed on the electrode catalyst support member, so as to be~~

~~attached thereto.~~

The method of claim 21, wherein the second step comprises:  
spraying liquid particles containing the electrode catalyst to the  
catalyst holding body;

5       drying the liquid particle-sprayed catalyst holding body; and  
compressing the dried catalyst holding body.

23.      The method of claim 22, wherein, in the attaching step, liquid  
particles containing the granule type electrode catalyst are sprayed to the  
10     electrode catalyst support member, so as to be attached thereto.

The method of claim 21, wherein the second step comprises:  
dissolving the power type electrode catalyst in a solution;  
soaking the catalyst holding body in the electrode catalyst-dissolved  
solution;

15     taking out the catalyst holding body and drying it; and  
compressing the dried catalyst holding body.

24.      The method of claim 22 or 23, wherein the attaching step  
comprises a sub-step of drying the electrode catalyst support member after  
20     the liquid particles are sprayed.

A method for fabricating an electrode of an electrochemical  
battery comprising:

fabricating a thin plate-type catalyst holding body having a fiber  
tissue;

25     depositing a power-type electrode catalyst at one surface of the

catalyst holding body to form an electrode catalyst layer; and  
attaching two electrode catalyst layer-formed catalyst holding bodies  
to each other in such a manner that the electrode catalyst layers contact  
with each other.

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25. ~~The method of claim 20, wherein the electrode catalyst support member is a metal fiber sintered body formed by sintering fibers of conductive metal material.~~

10 ~~The method of claim 24, wherein the two electrode catalyst layer-formed catalyst holding bodies are attached by compressing.~~

26. ~~The method of claim 20, wherein the forming step comprises:~~  
~~press-molding the electrode catalyst support member with the electrode catalyst attached thereto; and~~

15 ~~processing the press-molded electrode catalyst support member to an electrode in a desired size.~~

The method of claim 24 further comprising:

bending the two catalyst holding bodies as attached in a wave form.

20 27. ~~The method of claim 26, wherein, in the press-molding step, the pair of electrode catalyst support member with the electrode catalyst attached thereto is press-molded by mutually overlapping the sides with the electrode catalyst attached thereto.~~

25 28. ~~The method of claim 26 or 27, further comprising the step of:~~

~~enclosing the processed electrode with a housing which is made of metal material with a conductivity and has a plurality of holes, after the processing step.~~

5        29.     ~~The method of claim 28, wherein the housing is made of nickel or a nickel alloy.~~

30.     ~~The method of claim 28 or 29, wherein the housing is a mesh.~~

10      31.     ~~The method of claim 20, wherein the electrode catalyst support member is a non-woven fabric made of conductive metal material.~~

32.     ~~The method of claim 20, wherein the electrode catalyst has a filament shape.~~

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33.     ~~The method of claim 20, wherein the electrode catalyst is metal halide.~~

## ABSTRACT OF THE DISCLOSURE

An electrode of an electrochemical battery includes: an electrode catalyst  
5 and ~~an electrode catalyst support member made of a fiber stack of conductive metal material to which the electrode catalyst is attached. A manufacturing method of the electrode is simple and the battery can be small in volume and has a high flexibility and durability. And the specific surface area of the electrode catalyst is high. In addition, since the electrode catalyst support member of the electrode is made of the fiber stack, alkali fuel with a low surface tension can be easily infiltrated due to a capillary phenomenon, thereby enhancing an efficiency of the battery.~~  
10 ~~a catalyst holding body for holding and confining the electrode catalyst by being entangled with the electrode catalyst. A fabrication method of the electrode is simple, and the electrode has a small volume, high flexibility and durability. A specific surface area of the electrode catalyst is large and an efficiency of the battery can be improved.~~  
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